Sonos, Inc.'s Opp'n to Google LLC's Motion *In Limine* No. 4

EXHIBIT C

(Filed Under Seal)

SONOS

IP License Model

7/12/2018

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IP License Model

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I. Overview

Goal: Obtain a royalty rate that reflects the value attributable to the features of Google's products that are covered by the Sonos patent portfolio.

How to Get There:

1. Round 1: identify the commercially desirable/marketable features found today in Google's smart speakers, and how those features are presented to consumers.
2. Round 2: determine Sonos' IP contribution with respect to those features.
3. Calculate a royalty rate using (1) the identified features, (2) Sonos's contribution, and (3) the estimated profits of Google's smart speakers.

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II. Licensing Rates

Step 1: Feature List

We want to promote innovation across the industry, and our framework was built to support that desire by taking into account the innovation of others. Ultimately, our rate goes up for a pure copy of Sonos (not very exciting) and goes down as others innovate on top of Sonos (exciting and forces us to innovate even more).

To start, irrespective of IP, we identified a list of commercially marketed features found today in smart speakers. **FOUR** main categories emerged:

1. **Connected Playback Device.** A stand-alone, network-enabled media player, speaker, or playback device.
    - 12 Characteristic Features
        - 11 used by Max; 9 Home; 9 Mini; 8 Cast Dongle
    - Up to 7 Characteristics used by Google are covered by Sonos patents
2. **Voice Assistant Device.** A stand-alone player, speaker, or playback device with a built-in voice assistant.
    - 2 Characteristic Features
        - 2 used by Max; 2 Home; 2 Mini; 2 Cast Dongle
    - 0 Characteristics covered by Sonos patents
3. **Multi-device Platform.** Multiple devices working together.
    - 5 Characteristic Features
        - 5 used by Max; 5 Home; 5 Mini; 5 Cast Dongle
    - 3 Characteristics used by Google are covered by Sonos patents
4. **Premium Sound Experience.** Hardware and software features of a playback device to produce premium sound.
    - 8 Characteristic Features
        - 7 used by Max; 0 Home; 0 Mini; 0 Cast Dongle
    - 4 Characteristics used by Max are covered by Sonos patents

* Features and enabling technology within each category are provided along with their definitions in the "Supporting Materials" section at the back.

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II. Licensing Rates

Step 1A: Desirability and Marketability

A product's feature offering drive sales and ultimately its profits. Looking to how these features were presented and/or valued by consumers/reporters, we were able to weight each category accordingly:

	Google Mini	Google Home	Google Max	Cast Dongle
Connected Device	37%	37%	25%	80%
Voice Assistant	44%	44%	30%	0%
Multi-Device	19%	19%	24%	20%
Premium Sound	0%	0%	21%	0%

* The values are supported by material shown in their respective "Supporting Materials" section at the back.

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SONOS-SVG2-00041811

II. Licensing Rates

Step 1B: Sonos IP Contribution U.S. (as of 7/12/2018)

Starting in 2002, Sonos created a new market category: the modern version of the smart speaker. Over those years, Sonos devoted significant time and money inventing new ideas that made their way into these kinds of products. We protected many of those new ideas with patents.

We want to drive innovation across the industry and this framework shows that: a pure Sonos copy would overlap a large amount of Sonos IP. However, if a company innovated on top of Sonos with new features that drive demand, then they would overlap less of Sonos IP. As seen below, we sought to value only Sonos' contribution for which we have IP in the U.S. to those four main feature categories.

	Google Mini	Google Home	Google Max	Cast Dongle
Connected Device	33%	33%	58%	25%
Voice Assistant	0%	0%	0%	0%
Multi-Device	60%	60%	60%	60%
Premium Sound	0%	0%	50%	0%

* The values are supported by material shown in their respective "Supporting Materials" section at the back.

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II. Licensing Rates

Step 1B: Patent Families With Identified Patents

As of 7/12/2018, we have identified 53 utility patents from 17 different Sonos utility patent families that cover aspects of Google products.

	17 Patent Families Covering Google Today	Total Patents per Category
Connected Playback Device (Standalone)	8	13
Voice Assistant Device (Standalone)	0	0
Multi-Device Platform	5	31
Premium Sound Device	4	9
Total	**17**	**53**

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II. Licensing Rates

Step 1B: Patent Families Without Identified Patents

Today, Sonos has 290 utility patent families (some containing issued patents and some containing only pending patent applications). 82 of those families include issued patents that cover aspects of Sonos products. As previously mentioned, 17 of those families include issued patents that cover aspects of Google products, leaving 273 total utility patent families that Google is currently not known to practice.

	290 Total Patent Families	273 Additional Patent Families Not Included	82 Patent Families Practiced by Sonos Today
Connected Playback Device (Standalone)	114	106	31
Voice Assistant Device (Standalone)	17	17	1
Multi-Device Platform	84	79	19
Premium Sound Device	75	71	31
Total	290	273	82

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II. Licensing Rates

Step 1C: Sonos IP Contribution, ROW (as of 7/12/2018)

Sonos has patent portfolios in Europe, Japan, and China. Given that the breadth of these portfolios (today) is less than that found in the U.S. portfolio, we separated the U.S. from the rest of the world (ROW). Particularly, we sought to value Sonos' contribution for which we have IP in Europe to those four main feature categories:

	Google Mini	Google Home	Google Max	Cast Dongle
Connected Device	0%	0%	7%	0%
Voice Assistant	0%	0%	0%	0%
Multi-Device	20%	20%	20%	20%
Premium Sound	0%	0%	25%	0%

* The values are supported by material shown in their respective "Supporting Materials" section at the back.

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II. Licensing Rates

Step 2A: Gross Profit

Google is using smart speakers as a "loss leader" to inject Google Assistant into as many homes (and rooms) as possible, with the ultimate aim to earn profit on its core business. Instead of attempting to frame how much profit Google will ultimately derive from the sale of such hardware and the obtainment of households, we instead looked to more traditional viewpoint — hardware margin – as it relates to gross profit. Using very conservative figures, profit looks like:

	Mini	Home	Max	Cast Dongle
MSRP	$49	$129	$399	$35
COGM	49%	49%	49%	49%
Channel Margin	20%	20%	20%	20%
Logistics	5%	5%	5%	5%
Gross Profit	**$12.74**	**$33.54**	**$103.74**	**$9.10**

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II. Licensing Rates

Step 2B: Per-Unit Rate – Google, U.S.

Google Mini	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	37%		33%				$1.56	
Voice Assistant	44%	X	0%	X	$12.74	=	$0.00	**$3.01**
Multi Device	19%		60%				$1.45	
Premium Sound	0%		0%				$0.00	

Google Home	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	37%		33%				$4.10	
Voice Assistant	44%	X	0%	X	$33.54	=	$0.00	**$7.92**
Multi Device	19%		60%				$3.82	
Premium Sound	0%		0%				$0.00	

Google Max	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	25%		58%				$14.00	
Voice Assistant	30%	X	0%	X	$103.74	=	$0.00	**$40.87**
Multi Device	24%		60%				$14.94	
Premium Sound	21%		50%				$10.89	

Cast Dongle	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	80%		25%				$2.26	
Voice Assistant	0%	X	0%	X	$9.10	=	$0.00	**$2.91**
Multi Device	20%		60%				$1.09	
Premium Sound	0%		0%				$0.00	

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II. Licensing Rates

Step 2C: Per-Unit Rate – Google, ROW

Google Mini	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	37%		0%				$0.00	
Voice Assistant	44%	X	0%	X	$12.74	=	$0.00	**$0.48**
Multi Device	19%		20%				$0.48	
Premium Sound	0%		0%				$0.00	

Google Home	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	37%		0%				$0.00	
Voice Assistant	44%	X	0%	X	$33.54	=	$0.00	**$1.27**
Multi Device	19%		20%				$1.27	
Premium Sound	0%		0%				$0.00	

Google Max	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	25%		7%				$2.07	
Voice Assistant	30%	X	0%	X	$103.74	=	$0.00	**$12.24**
Multi Device	24%		20%				$5.08	
Premium Sound	21%		25%				$0.00	

Cast Dongle	Feature Value		Sonos Contribu-tion		Profit		License	Total License
Connected Device	80%		0%				$0.00	
Voice Assistant	0%	X	0%	X	$9.10	=	$0.00	**$0.36**
Multi Device	20%		20%				$0.36	
Premium Sound	0%		0%				$0.00	

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II. Licensing Rates

Step 2C: Per Unit Rate - Ecosystem, U.S./ROW

Google's ecosystem products fall into two categories (1) speakers that utilize Chromecast as the **primary** platform for obtaining and controlling audio (*e.g.*, JBL's Link series of speakers), and (2) Chromecast-enabled speakers where Chromecast is **secondary** to other, proprietary means of obtaining and controlling audio (*e.g*, Sony's Music Center platform wireless speakers). Google's contribution to the marketability of these products differs*. To determinate a rate for these products, we conservatively used Google Home's profit margins.

Chromecast Primary Products:

Google features are the primary drivers in the marketing of these products. For example, for JBL's Link products, most features touted on the site for its Link products relates to Google functionality. Sony's LF speaker also prominently discusses Google features. Given the importance of Google features (~80%), the license rate for these products is **$7.24** per unit in the U.S and **$1.28** per unit ROW.

Chromecast Secondary Products:

These products can be controlled either by their own proprietary software, or by a Google device, such as the Chromecast/Home apps or a Google Home speaker. These products do not have embedded mics, there is thus no value attributable to voice. Rather, any value that would be attributable to voice is instead in the multi-device category, as one device is used to control. Of the websites analyzed, Chromecast/Google Home is featured in ~25% of the feature callouts. This results in a license rate of **$3.48** per unit in the U.S. and **$0.88** per unit ROW.

* The values are supported by material shown in their respective "Supporting Materials" section at the back.

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Supporting Materials

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Step 1: Feature List

Connected Device Features

Marketed Feature	Characteristics of the Marketed Feature	Enabling Tech
Connected Playback Device (Standalone)	Connected Playback Device Setup	(1) Player Setup (2) Streaming Service Setup
	Wi-Fi Streaming	(1) LAN/local source (2) remote source
	Support for only one streaming service	(1) register a single service with playback device (2) cloud queue
	Speaker Support for Multiple Streaming Services	(1) switching between music services (2) universal search
	Line-in	(1) physical line-in source switching (2) virtual line-in (e.g., bluetooth) source switching
	Line-out	[]
	Bluetooth	(1) Setup (2) Real-time streaming
	Control Interface (SW)	(1) Guest Access (2) Native control (3) direct control (third-party control of a device)
	Control Interface (HW)	(1) hardware control interface on connected playback device
	Power and Power Management	Power save technology
	Fault Detection/Recovery	(1) Physical Fault Detection (2) Playback Fault Detection
	Features Updates (SW)	(1) firmware/configuration (2) app store (3) skills

Voice Assistant Device Features

Marketed Feature	Characteristics of the Marketed Feature	Enabling Tech
Voice Assistant Device (Standalone)	Smart Assistant (SW)	(1) machine learning (2) search expertise
	Voice Detection	(1) mic array (2) beam forming (SW) (3) wake word engine (SW) (4) arbitration (SW) (5) voice capture processing

Step 1: Feature List

Multi-Device Features

Marketed Feature	Characteristics of the Marketed Feature	Enabling Tech
Multi-Device Platform	Multi-Device Playback Control (SW)	(1) Group Content/Playback Control (2) Group Formation (3) Group Volume (4) zone scenes (5) group navigation and maintenance (6) source switching (7) multiple controllers
	Multi-Device Playback (SW)	(1) synchronized playback (2) audio distribution
	Multi-Device Voice	(1) Multi device voice input (2) Multi device voice output
	Smart Home Integration (SW)	(1) output/action device(s) (2) IoT Scenes (3) educational and entertainment functions
	Multi-Device Networking	(1) ad hoc/STP configurations (SW) (2) direct routing/communication from GC to GM (SW) (3) Fault Tolerance (4) Designating group coordinator (5) Changing group coordinator (6) Setup

Premium Sound Features

Marketed Feature	Characteristics of the Marketed Feature	Enabling Tech
Premium Sound Device	Orientation	(1) sound shaping based on orientation
	Bonded Zones	(1) stereo pair (2) consolidated players (SUB; HT 5.1 etc)
	Custom Transducers	(1) woofers (2) tweeters
	Calibration	(1) calibration audio capture using built-in mics (HW) (2) calibration audio capture using external mics (3) audio processing algorithm calculation (SW)
	Lossless Streaming	(1) sufficient processing power and network capabilities (HW) (2) compatible DSP (SW)
	Sound Field Control	(1) purpose-designed transducers? (HW) (2) audio signal processing (SW) (3) acoustic baffle?
	Custom Amplifiers	(1) custom amplifier audio processing
	Enclosure	(1) Speaker Grill

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Step 1: Included US Patents Overview

Marketed Feature	Feature Category	Google Max Feature Covered by Sonos Patent
Connected Playback Device (Standalone)	Connected Playback Device Setup	1 patent
	Wi-Fi Streaming	
	Support for only one streaming service	4 patents
	Speaker Support for Multiple Streaming Services	
	Line-in	1 patent
	Line-out	
	Bluetooth	
	Control Interface (SW)	3 patents
	Control Interface (HW)	1 patent
	Power and Power Management	2 patents
	Fault Detection/Recovery	1 patent
	Features Updates (SW)	
Voice Assistant Device (Standalone)	Smart Assistant (SW)	
	Voice Detection	
Multi-Device Platform	Multi-Device Playback Control (SW)	21 patents
	Multi-Device Playback (SW)	8 patents
	Multi-Device Voice	2 patents
	Smart Home Integration (SW)	
	Multi-Device Networking	
Premium Sound Device	Orientation	2 patents
	Bonded Zones	4 patents
	Custom Transducers	
	Calibration	2 patents
	Lossless Streaming	
	Sound Field Control	1 patent
	Custom Amplifiers	
	Enclosure	

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Step 1: U.S. Patents Included

Sonos Patent Family	Patent Number		Marketed Feature
SYSTEM AND METHOD FOR SYNCHRONIZING OPERATIONS AMONG A PLURALITY OF INDEPENDENTLY CLOCKED DIGITAL DATA PROCESSING DEVICES	9,727,302	9,733,893	Multi-Device Platform
	9,182,777	9,176,520	
	9,164,532	9,733,891	
	9,218,017	9,733,892	
	9,195,258	8,938,637	
	9,207,905	8,370,678	
	9,170,600	8,689,036	
	9,213,356	9,348,354	
	9,778,900	9,189,011	
	9,740,453	EP1654614	
	9,727,304	EP2648111	
METHOD AND SYSTEM FOR CONTROLLING AMPLIFIERS	9,252,721	9,246,442	Connected Playback Device (Standalone)
METHOD AND APPARATUS FOR CONTROLLING MULTIMEDIA PLAYERS IN A MULTI-ZONE SYSTEM	8,588,949 (90/013,423)	7,571,014 (90/013,882)	Multi-Device Platform
PLAYBACK DEVICE CONNECTION	9,960,969		Connected Playback Device (Standalone)
CONTROLLING AND MANIPULATING GROUPINGS IN A MULTI-ZONE MEDIA SYSTEM	8,843,228	8,934,997	Multi-Device Platform
	9,749,760	9,860,657	
	9,344,206		
MAKING AND INDICATING A STEREO PAIR	9,219,959 (90/013,756)	8,788,080	Premium Sound Device
	9,202,509 (90/013,859)	EP2695400	
	9,928,026	EP3059980	
SMART LINE-IN PROCESSING	9,686,606		Connected Playback Device (Standalone)
SHAPING SOUND RESPONSIVE TO SPEAKER ORIENTATION	9,042,556	EP2735171	Premium Sound Device
	9,748,647		Premium Sound Device
SYSTEMS AND METHODS FOR NETWORKED MUSIC PLAYBACK	9,860,589		Connected Playback Device (Standalone)
ACOUSTIC SIGNATURES	8,930,005		Connected Playback Device (Standalone)
	9,519,454		
DETECTING IMPROPER POSITION OF A PLAYBACK DEVICE	9,367,611		Connected Playback Device (Standalone)
AUDIO SETTINGS BASED ON ENVIRONMENT	9,219,460	9,872,119	Premium Sound Device Premium Sound Device
CLOUD QUEUE	9,654,459	9,363,255	Connected Playback Device (Standalone)
	9,942,215	9,648,071	
DEVICE GROUP IDENTIFICATION	9,348,824		Multi-Device Platform
PLAYBACK DEVICE CONTROL	9,671,780	EP3100156	Connected Playback Device (Standalone)
MULTI-CHANNEL PLAYBACK OF AUDIO CONTENT	9,973,851		Premium Sound Device
DEFAULT PLAYBACK DEVICE	9,826,306	9,820,039	Multi-Device Platform

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Explanation of Step 1 Percentages—United States

	Google Home Max	Google Home	Google Mini	Cast Dongle Devices
Connected Playback Device (Standalone)	58% •12 Characteristics •11 Characteristics relevant to Google Max •7 Characteristics with Sonos blocking patents •8 Patent families, 13 patents	33% •12 Characteristics •9 Characteristics relevant to Google Home •4 Characteristics with Sonos blocking patents	33% •12 Characteristics •9 Characteristics relevant to Google Mini •4 Characteristics with Sonos blocking patents	25% •12 Characteristics •8 Characteristics relevant to Cast Dongle •3 Characteristics with Sonos blocking patents
Voice Assistant Device (Standalone)	0% •2 Characteristics •2 Characteristics relevant to Google Max	0% •2 Characteristics •2 Characteristics relevant to Google Home	0% •2 Characteristics •2 Characteristics relevant to Google Mini	0% •2 Characteristics •0 Characteristics relevant to Cast Dongle.
Multi-Device Platform	60% •5 Characteristics •5 Characteristics relevant to Google Max •3 Characteristics with Sonos blocking patents •5 Patent families, 31 patents	60% •5 Characteristics •5 Characteristics relevant to Google Home •3 Characteristics with Sonos blocking patents •5 Patent families, 31 patents	60% •5 Characteristics •5 Characteristics relevant to Google Mini •3 Characteristics with Sonos blocking patents •5 Patent families, 31 patents	60% •5 Characteristics •5 Characteristics relevant to Cast Dongle •3 Characteristics with Sonos blocking patents •5 Patent families, 31 patents
Premium Sound Device	50% •8 Characteristics •7 Characteristics relevant to Google Max •4 Characteristics with Sonos blocking patents •4 Patent families, 9 patents	0% •8 Characteristics •0 Characteristics relevant to Google Home	0% •8 Characteristics •0 Characteristics relevant to Google Mini	0% •8 Characteristics •0 Characteristics relevant to Cast dongle

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Explanation of Step 1 Percentages—Europe

	Google Home Max	Google Home	Google Mini	Cast Dongle Devices
Connected Playback Device (Standalone)	7%	0%	0%	0%
	•12 Characteristics •11 Characteristics relevant to Google Max •1 Characteristic with Sonos blocking patents	•12 Characteristics •9 Characteristics relevant to Google Home	•12 Characteristics •9 Characteristics relevant to Google Mini	•12 Characteristics •8 Characteristics relevant to Cast Dongle
Voice Assistant Device (Standalone)	0%	0%	0%	0%
	•2 Characteristics •2 Characteristics relevant to Google Max	•2 Characteristics •2 Characteristics relevant to Google Home	•2 Characteristics •2 Characteristics relevant to Google Mini	•2 Characteristics •0 Characteristics relevant to Cast Dongle.
Multi-Device Platform	20%	20%	20%	20%
	•5 Characteristics •5 Characteristics relevant to Google Max •1 Characteristic with Sonos blocking patents	•5 Characteristics •5 Characteristics relevant to Google Home •1 Characteristic with Sonos blocking patents	•5 Characteristics •5 Characteristics relevant to Google Mini •1 Characteristic with Sonos blocking patents	•5 Characteristics •5 Characteristics relevant to Cast Dongle •1 Characteristic with Sonos blocking patents
Premium Sound Device	25%	0%	0%	0%
	•8 Characteristics •7 Characteristics relevant to Google Max •2 Characteristics with Sonos blocking patents	•8 Characteristics •0 Characteristics relevant to Google Home	•8 Characteristics •0 Characteristics relevant to Google Mini	•8 Characteristics •0 Characteristics relevant to Cast dongle

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Step 1: Feature List

1. **Connected Playback Device.** A stand-alone, network-enabled media player, speaker, or playback device.

1.1 Connected Playback Device Setup. Setup of the connected playback device.

1.1.1 Player Setup. Setup of connected playback device including setting up accounts and network access.

1.1.2 Streaming Service(s) Setup. Setup of streaming service account(s) on the playback device.

1.2 Wi-Fi Streaming. Obtaining media content for playback via wi-fi.

1.2.1 LAN/Local Source. Obtaining media content for playback from a local source on the same local area network (LAN) as the connected playback device.

1.2.2 Remote Source. Obtaining media content for playback from a remote source via a wide area network (WAN) (i.e., from the cloud).

1.3 Single Streaming Service Support. Playback device can only obtain media for playback from one streaming service.

1.3.1 Single Streaming Service Registration. Registering a single streaming service with the playback device thereby enabling the playback device to use streaming service credentials to access content from the streaming service.

1.3.2 Cloud Queue. The playback queue from which a playback device sources media items to play back is stored in and driven from the cloud. When the playback device needs to update its queue, it requests the items from the cloud.

1.4 Multiple Streaming Service Support. Playback device can obtain media from at least two streaming services for playback.

1.4.1 Switching between Music Services. Playback device can switch between obtaining media content from different streaming services for playback.

1.4.2 Universal Search. The playback system can simultaneously search across media catalogs of multiple streaming services.

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Step 1: Feature List

Cont.

1.5 Line-In. Playback device has a physical media input port (e.g., aux port, optical port) or virtual input interface.

1.5.1 Physical Line-in Source Switching. Playback device can switch between playing back media received via the physical input port and media obtained via a virtual input source.

1.5.2 Virtual Line-in Source Switching. Non-physical, digital input for media. Playback device can switch between playing back media received via the physical input port and media obtained via the virtual input.

1.6 Line-Out. An audio output port.

1.7 Bluetooth.

1.7.1 Setup. Bluetooth used in playback device setup process, for example, to pass network credentials.

1.7.2 Real-Time Streaming. Playback device receives a real-time media stream via Bluetooth for playback.

1.8 (Software) Control Interface. Control interface on a device distinct from the playback device.

1.8.1 Guest Access. Access to a playback device by a guest to thereby enable a guest to use a playback device without receiving network or other account credentials.

1.8.2 Native Control. Control interface provided by the same party as the playback device

1.8.3 Direct Control. Control of a playback device via a third-party's control interface.

1.9 (Hardware) Control Interface. Control interface on the playback device (e.g., touch interface).

1.10 Power and Power Management.

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Step 1: Feature List

Cont.

1.11 Fault Detection/Recovery.

1.12 (Software/Firmware) Feature Updates. New features can be added to the playback device.

1.12.1 Firmware/Configuration Updates. New features can be added to the playback device through firmware updates.

1.12.2 App Store. New features can be added to the playback device by installing apps.

1.12.3 Skills. New features can be added to the playback device by enabling skills.

1.13 Industrial Design. Design of the connected playback device.

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Step 1: Feature List

2. **Voice Assistant Device.** A stand-alone player, speaker, or playback device with a built-in voice assistant.

2.1 Smart Assistant. Voice assistant.

2.1.1 Machine Learning. Voice assistant technology that uses machine learning to respond to queries or commands in a voice command.

2.1.2 Search Expertise. Search engine used to power responses to voice commands.

2.3 Voice Detection. Device detecting that a voice command is being/has been uttered.

2.3.1 Mic Array. Voice assistant device includes a mic array to detect voice commands.

2.3.2 Beam Forming. Device includes a microphone array capable of beamforming.

2.3.3 Wake Word Engine. Processing on the player to detect utterance of a wake word.

2.3.4 Arbitration. Processing on the player to determine which player is to respond to a voice command when more than one voice capable player detects the voice command.

2.3.5 Voice Capture Processing. Processing on the player to clean up the voice capture before transmitting for speech-to-text conversion.

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Step 1: Feature List

3. Multi-Device Platform. Multi-room.

3.1 Multi-Device Control.

3.1.1 Group Content/Playback Control.

3.1.2 Group Formation.

3.1.3 Group Volume.

3.1.4 Zone Scenes.

3.1.5 Group Navigation and Maintenance.

3.1.6 Source Switching.

3.1.7 Multiple Controllers.

3.2 Multi-Device Playback (SW).

3.2.1 Synchronized Playback.

3.2.2 Audio Distribution.

3.3 Multi-Device Voice.

3.3.1 Multi-Device Voice Input.

3.3.2 Multi-Device Voice Output.

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Step 1: Feature List

3. Multi-Device Platform. Multi-room.

3.4 Smart Home Integration. Voice assistant device is used to control internet of things.

3.4.1 Output/Action Device. Voice assistant device can execute commands or output audio on a default device or on a particular device(s) targeted in the voice command.

3.4.2 IoT Scenes. Scenes or routines used to automatically trigger certain functions in response to particular events.

3.4.3 Education and Entertainment Functions.

3.5 Multi-Device Networking.

3.5.1 Ad-Hoc/STP Configurations.

3.5.2 Direct Routing/Communication from GC to GM

3.5.3 Fault Tolerance.

3.5.4 Group Coordinator Selection.

3.5.5 Changing Group Coordinator.

3.5.6 Setup.

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Step 1: Feature List

4. **Premium Sound Device.** Hardware and software features of a playback device to produce premium sound.

4.1 Orientation. Playback device can be placed in different orientations.

4.1.1 Orientation-Based Sound Shaping. Sound of the playback device can be shaped based on its current orientation.

4.2 Bonded Zones.

4.2.1 Stereo Pair.

4.2.2 Consolidated Players. A group of playback devices that as a group playback a full frequency range or channel set. For example, 3.1 surround, 5.1 surround, etc.

4.3 Custom Transducers. Purpose-designed transducers.

4.3.1 Woofers. Purpose-designed woofers.

4.3.2 Tweeters. Purpose-designed tweeters.

4.4 Calibration. Audio playback can be calibrated based on environmental conditions.

4.4.1 Built-In Mics. Audio playback can be calibrated using audio captured by mics internal to the playback device.

4.4.2 External Mics. Audio playback can be calibrated using audio captured by mics external to the playback device.

4.4.3 Audio Processing Algorithm Calculation. Algorithm to calculate audio settings adjustments based on audio captured by mics.

4.5 Lossless Streaming.

4.5.1 Sufficient Processing Power and Network Capabilities.

4.5.2 Compatible DSP.

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Step 1: Feature List

Cont.

4.6 Sound Field Control.

4.6.1 Custom Transducers. Purpose-designed transducers.

4.6.2 Audio Signal Processing.

4.6.3 Acoustic Baffle. Playback device includes a mechanical structure to control directionality of audio.

4.7 Custom Amplifiers.

4.8 Enclosure.

4.8.1. Speaker Grill.

Step 2: Desirable Features

I. Google Website Analysis

- Google Home Mini "Overview" and "Learn" Websites
- Google Home "Overview" and "Learn" Websites
- Google Home Max "Overview" and "Learn" Websites
- Google Chromecast Audio Dongle Website
- Desirable Feature Breakdown

II. Google Home Press

- Press/Tweets
- Articles

III. Ecosystem Analysis

- Chromecast Primary
- Chromecast Secondary

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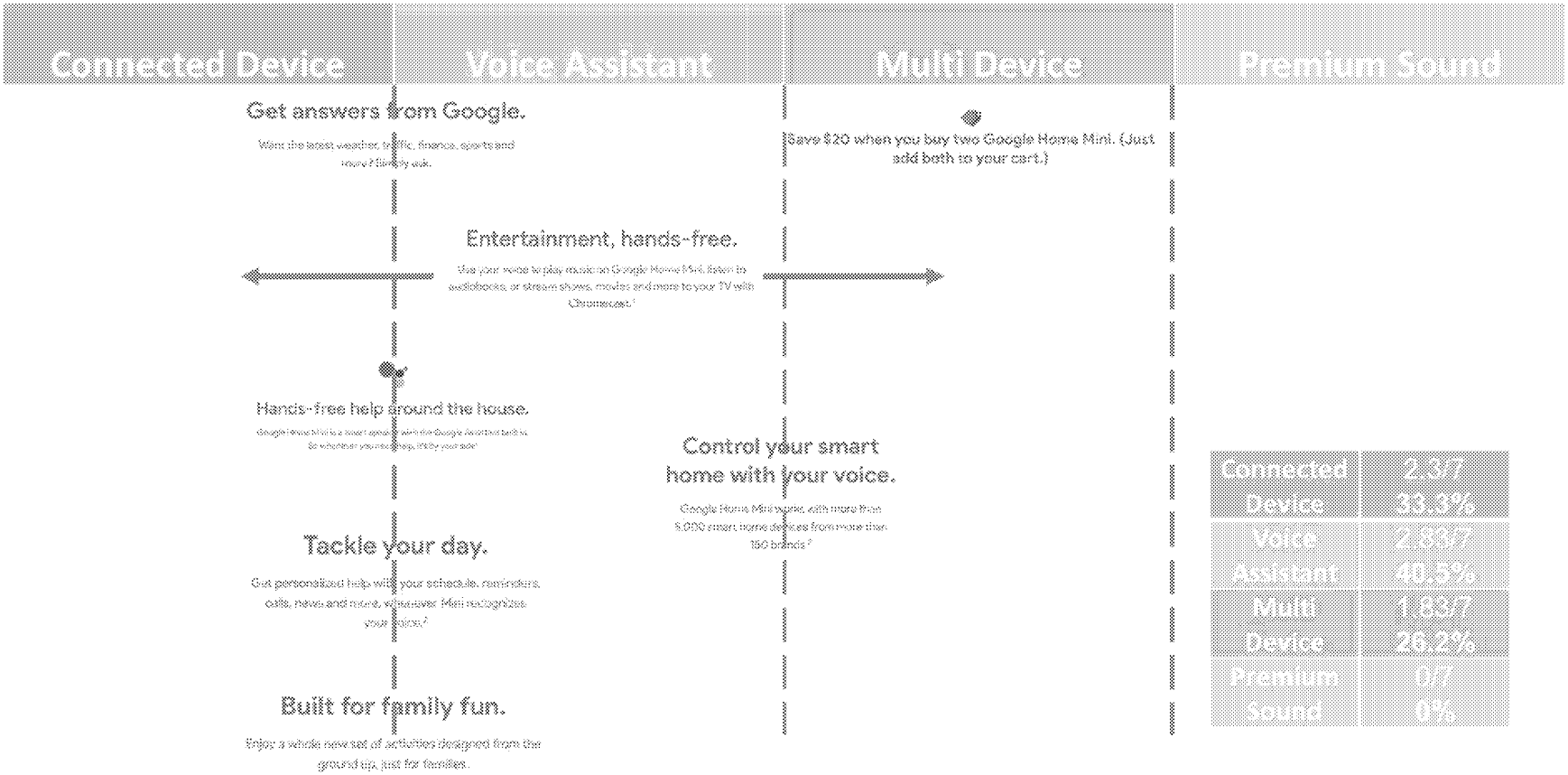
Google Home Mini "Overview" Website



Connected Device	2,3/7 33.3%
Voice Assistant	2,3/7 40.5%
Multi Device	1,8/7 26.2%
Premium Sound	0/7 0%

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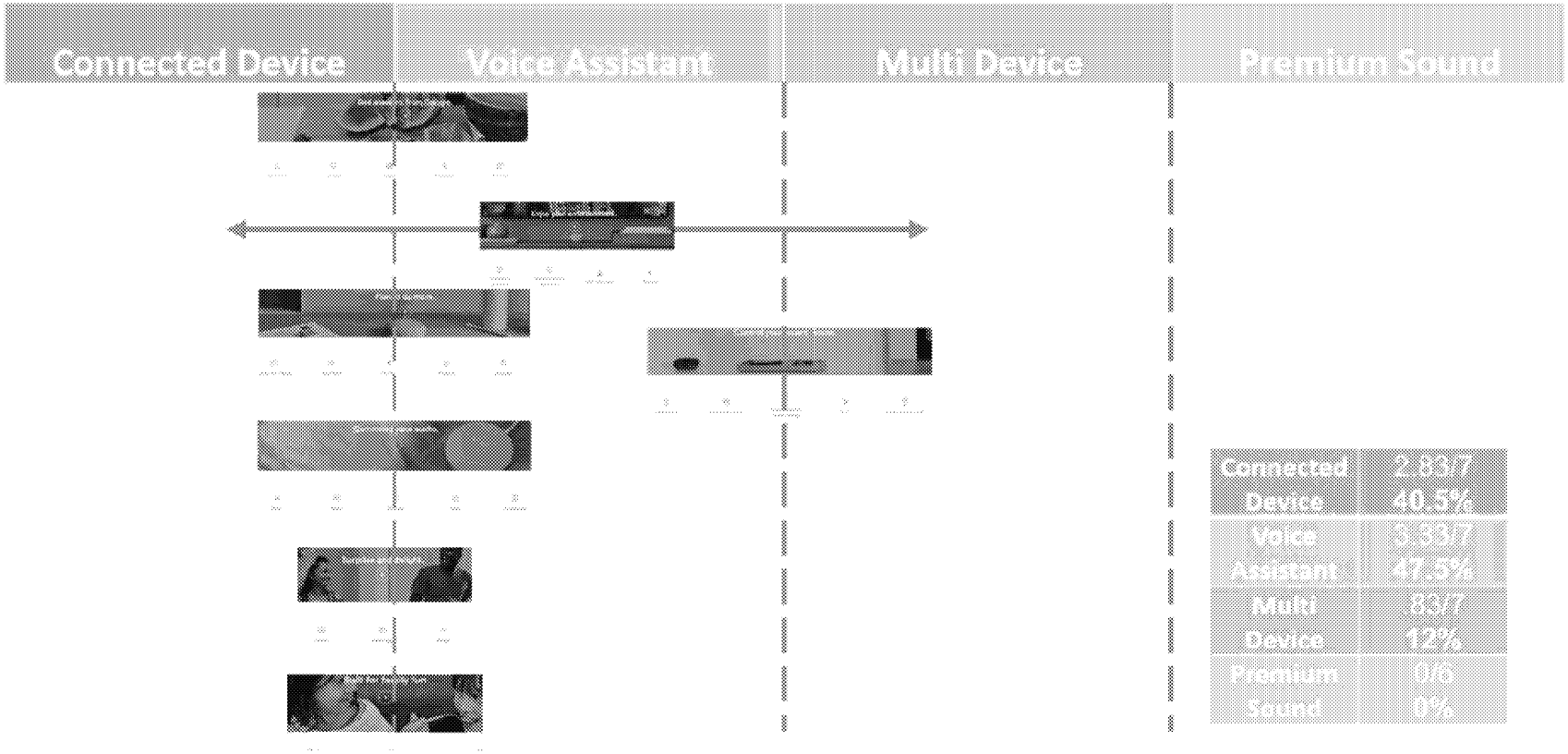
Google Home Mini "Learn" Website



Connected Device	2.33/7 40.5%
Voice Assistant	3.33/7 47.5%
Multi Device	0.33/7 12%
Premium Sound	0/6 0%

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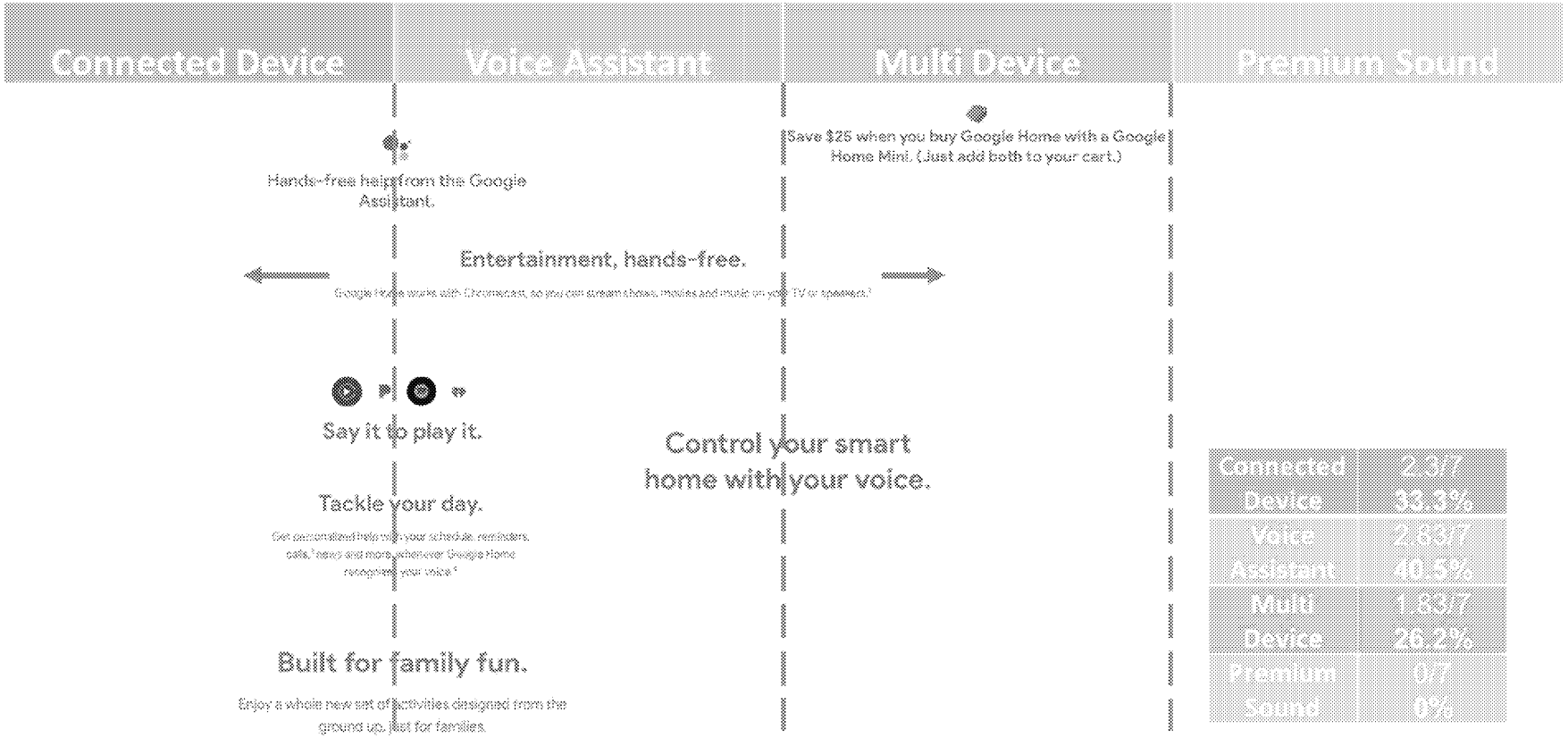
Google Home "Overview" Website



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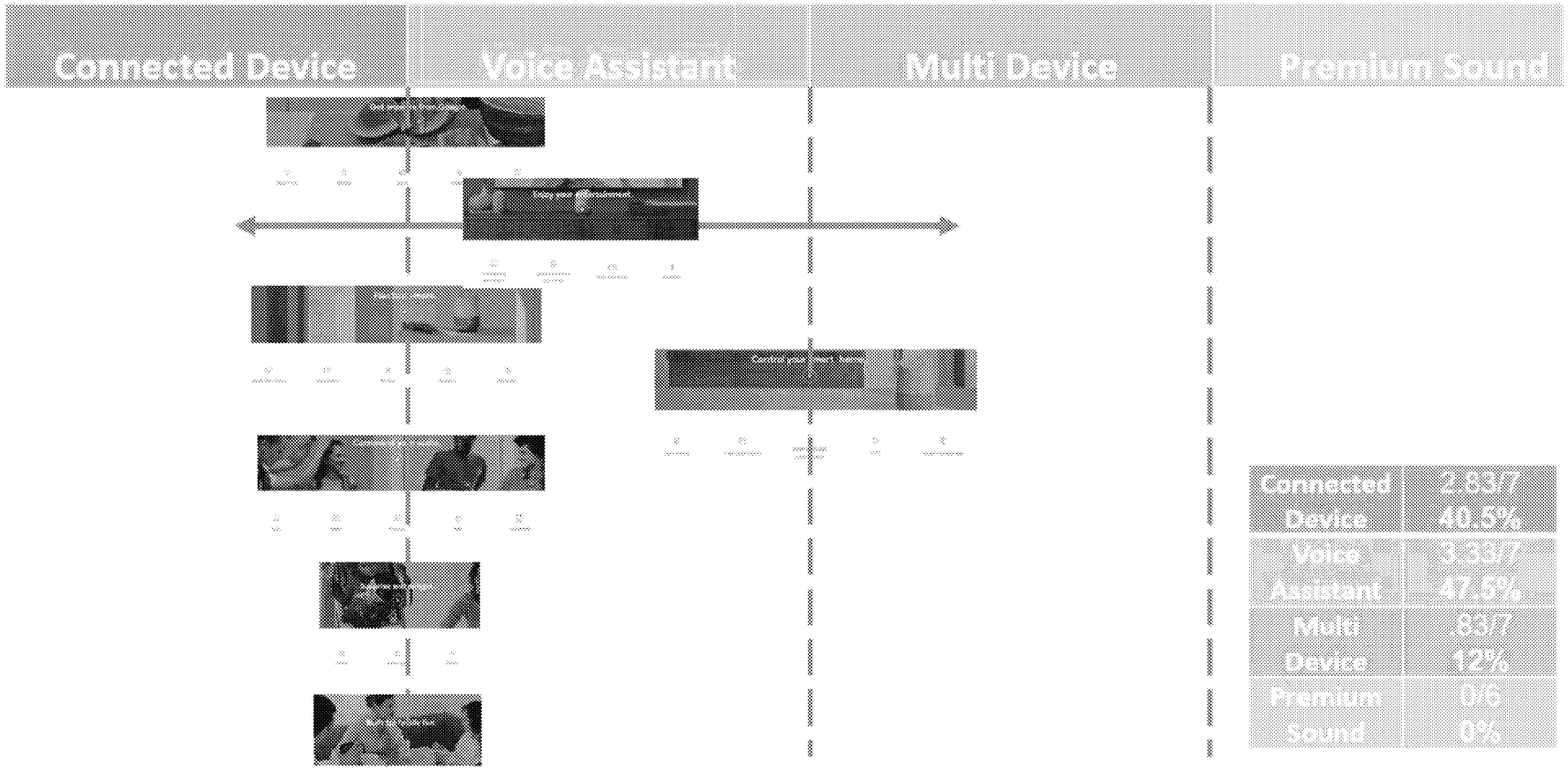
Google Home "Learn" Website



Connected Device	2.33/7 40.5%
Voice Assistant	3.33/7 47.5%
Multi Device	.33/7 12%
Premium Sound	0/6 0%

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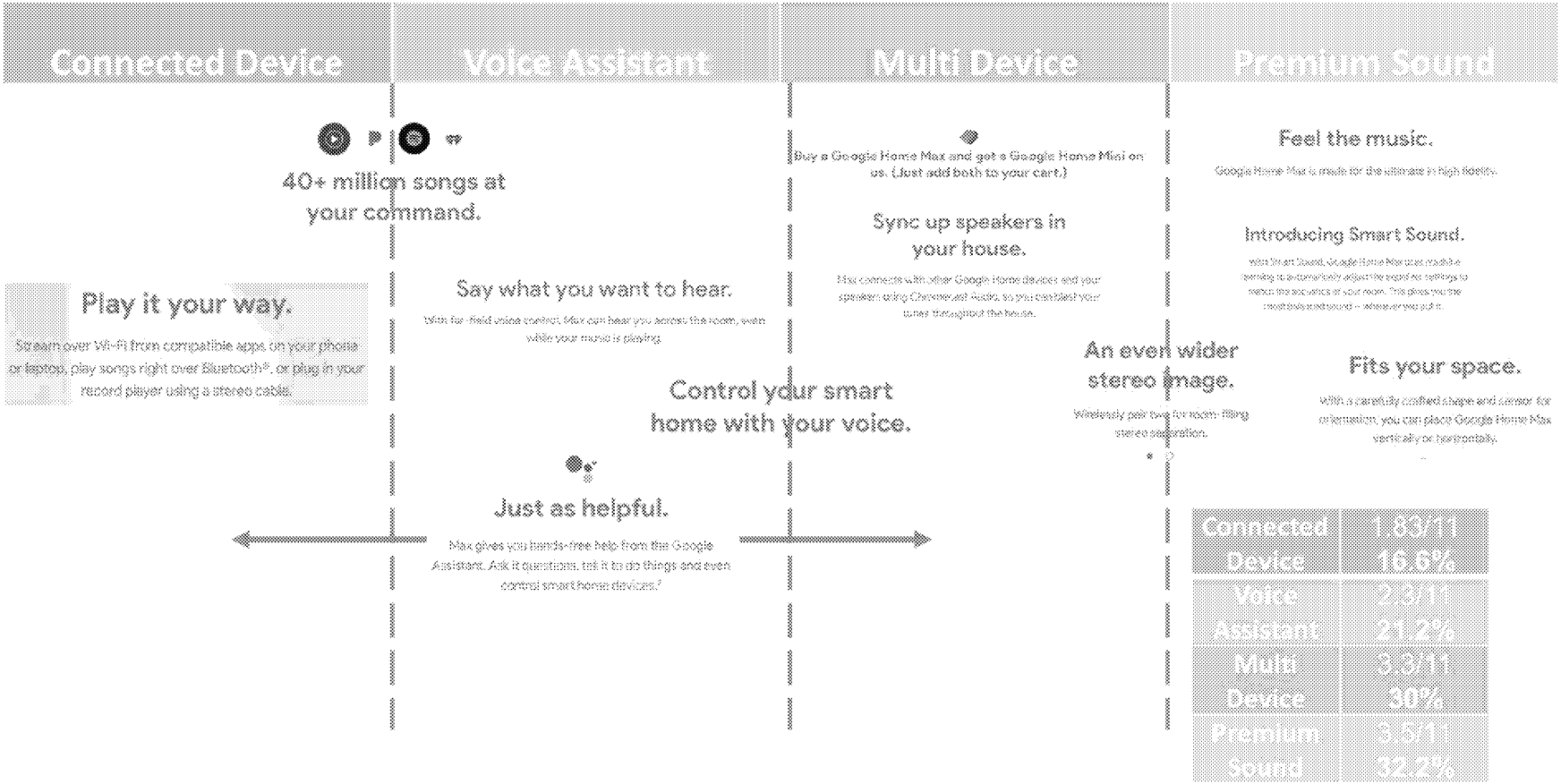
Google Home Max "Overview" Website



Connected Device	1.83/11 16.6%
Voice Assistant	2.33/11 21.2%
Multi Device	3.3/11 30%
Premium Sound	3.5/11 32.2%

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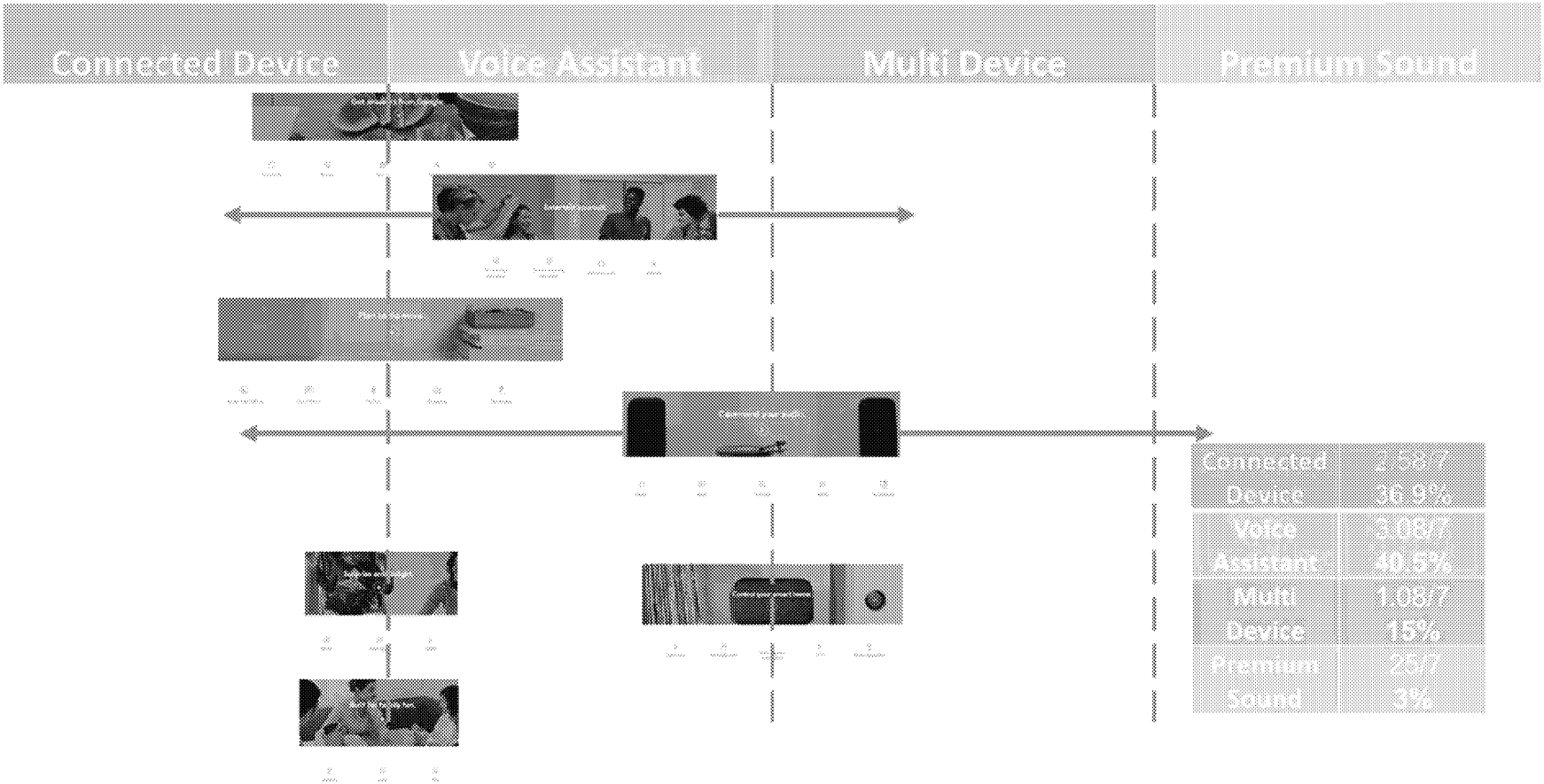
Google Home Max "Learn" Website



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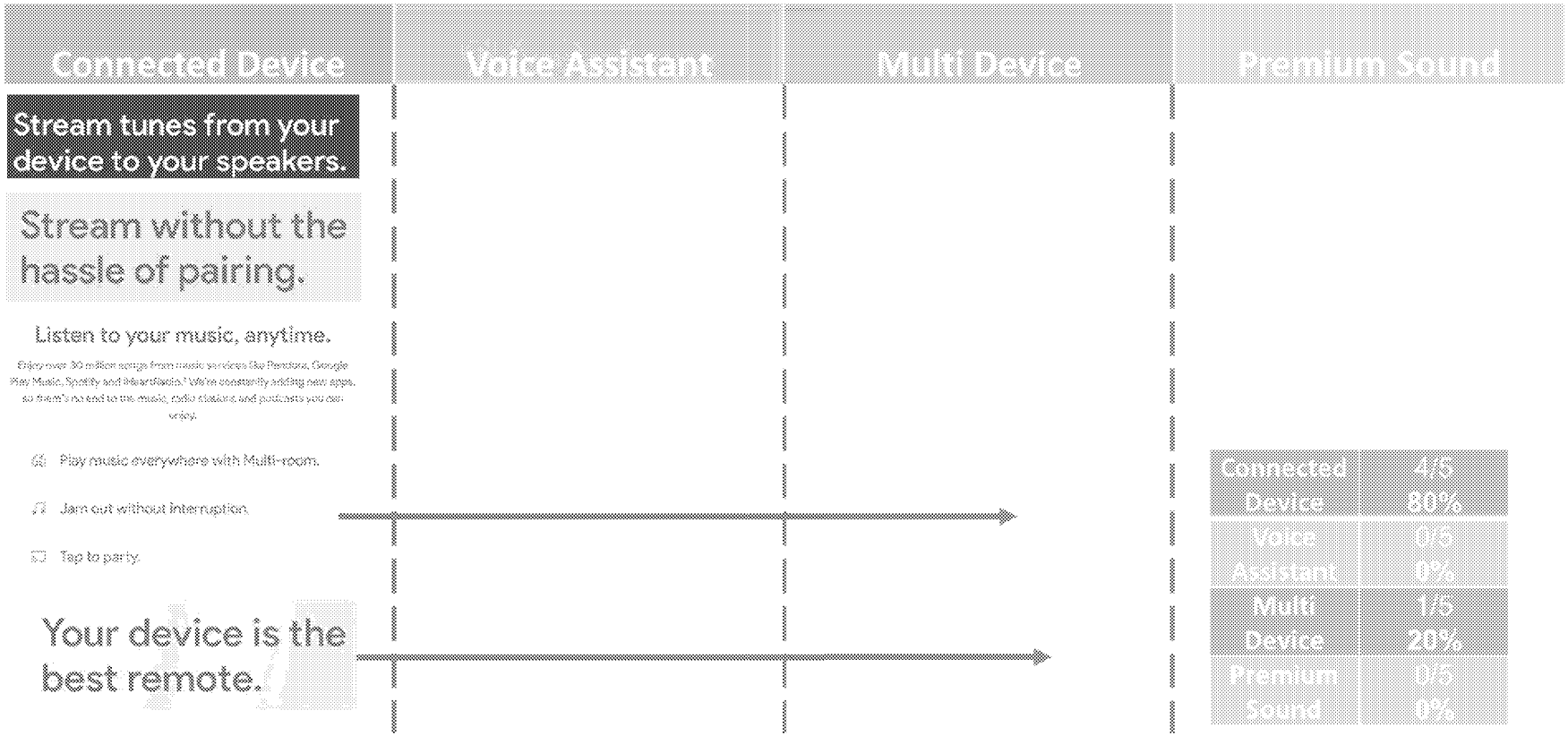
Chromecast Audio Dongle Website



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Desirable Features Breakdown

	Google Home Mini	Google Home	Google Home Max	Chromecast Audio
Connected Device	37%	37%	25%	80%
Voice Assistant	44%	44%	30%	0%
Multi Device	19%	19%	24%	20%
Premium Sound	0%	0%	21%	0%

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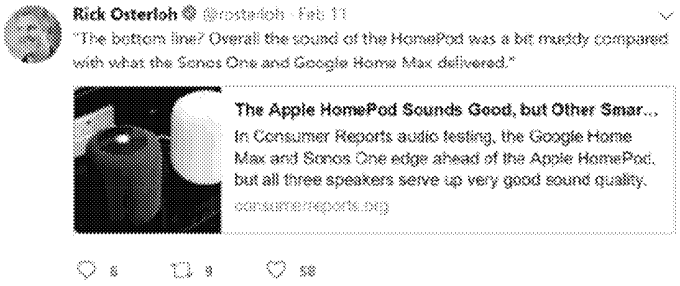
Google Press/Tweets

Press and tweets relating to Google Home confirm the features breakdown from Google's website. Rick Osterloh has tweeted numerous articles touting the features of Google Home products:

Article tweeted by Rick Osterloh identifies 8 reasons to buy a Google Home Max. Four of those reasons relate to multi-device and/or premium sound.

Of the 5 rounds described in the video tweeted by Rick Osterloh, 3 relate to multi-device and premium sound.



Article tweeted by Rick Osterloh notes that "unlike the Home Max or the Sonos One, the HomePod doesn't offer stereo pairing, or Sonos-style multiroom capability . . . yet. "

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Google Press/Marketing

With Google, it always seems to come back to that search box. The company might be unveiling a large family of products. It might have hired a couple thousand new phone engineers. **It might even be serious about creating products that are directly competitive with** Apple, Samsung, Amazon, Bose, **Sonos**, and many others. **It is doing all of those things. For the time being, however, it's not doing them at a massive scale — yet.**

But after talking to Osterloh, it's very clear that Google wants to.

Source: The Verge, October 4, 2017

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Google Press/Marketing

ONE MAN'S QUEST TO MAKE GOOGLE'S GADGETS GREAT

Google is leaning on Rick Osterloh to completely rewrite its strategy for hardware, with one core goal: Put its virtual assistant everywhere in people's lives.

But the nature of computing is changing, and its **next phase won't revolve around app stores and smartphones. It will center instead on artificially intelligent devices that fit seamlessly into their owners' everyday lives.** It will feature voice assistants, simple wearables, smart appliances in homes, and augmented-reality gadgets on your face and in your brain.

In other words, the future involves a whole lot more hardware, and for Google that shift represents an existential threat.

For the new hardware team, the task was clear: **Find more ways to get Google Assistant in front of people** and build a sustainable business around it

Source, Wired.com, February 8, 2018

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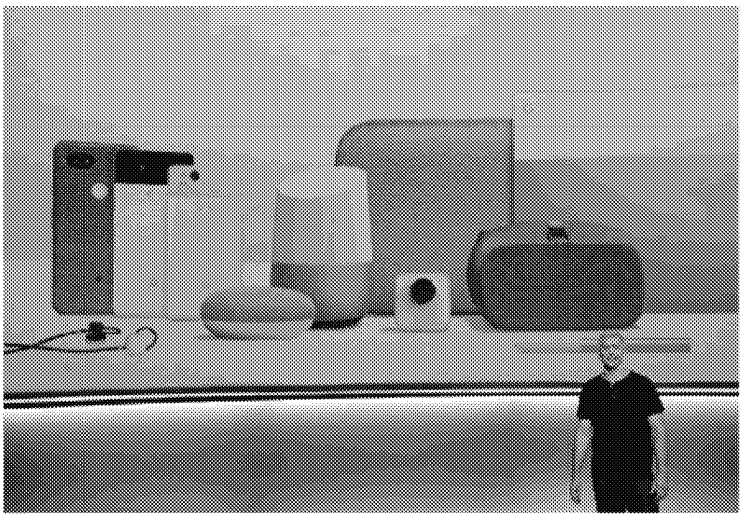
SONOS-ITC-00342404
SONOS-SVG2-00041846

Google Press/Marketing

Google Is Finally Getting Serious About Hardware. Here's Why.



We're moving into an era where, more than ever before, devices are simply a vehicle for user experiences.

...

When I asked Osterloh to name his favorite new Google device, he gave me the obligatory "I love all my children" line. Then he singled Home Max as one of the children he's most excited about. "It's a really interesting, innovative product," he said. "It not only combines our Assistant work, but all of the stuff we've done on Smart Sound where it adjusts to the room dynamics and changes the sound levels based to really match the room. I think it's a terrific experience." Google's AI is behind that experience too.

Source: Forbes.com, October 16, 2017

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Google Press/Marketing

Google Joins Azione, Pushing DIY Voice Control to Smart-Home Pros

Azione Unlimited, a buying group for home-technology pros, adds another DIY vendor to the roster -- Google Home -- shortly after Sonos joins the group.

Google Home has joined Azione Unlimited, a leading buying group in the home-technology channel with nearly 200 dealer members. The announcement comes just two weeks after another DIY vendor, Sonos, joined the group. With Sonos offering native Amazon Alexa in its new Sonos One speakers, Azione now represents the top two voice-control platforms **in the professional installation channel**.

Here's what Azione had to say about the Google deal in a press release no doubt vetted by Google's expansive PR and legal teams:

> Delivering high-quality audio and voice-activated personal assistant services, the Google Home portfolio is well-suited for both custom integration and DIY projects, easily **integrating with more than 1,500 smart home devices from over 225 brands.** Users can access more than 1 million actions to help to organize households, tackle everyday tasks, and present entertainment in a whole new way. Features include searching via Google; Voice Match; playing music, including via Bluetooth; music streaming via Spotify, Pandora and other popular services; hands-free phone calls; and local business search.

Source: CEPro.com, March 28, 2018

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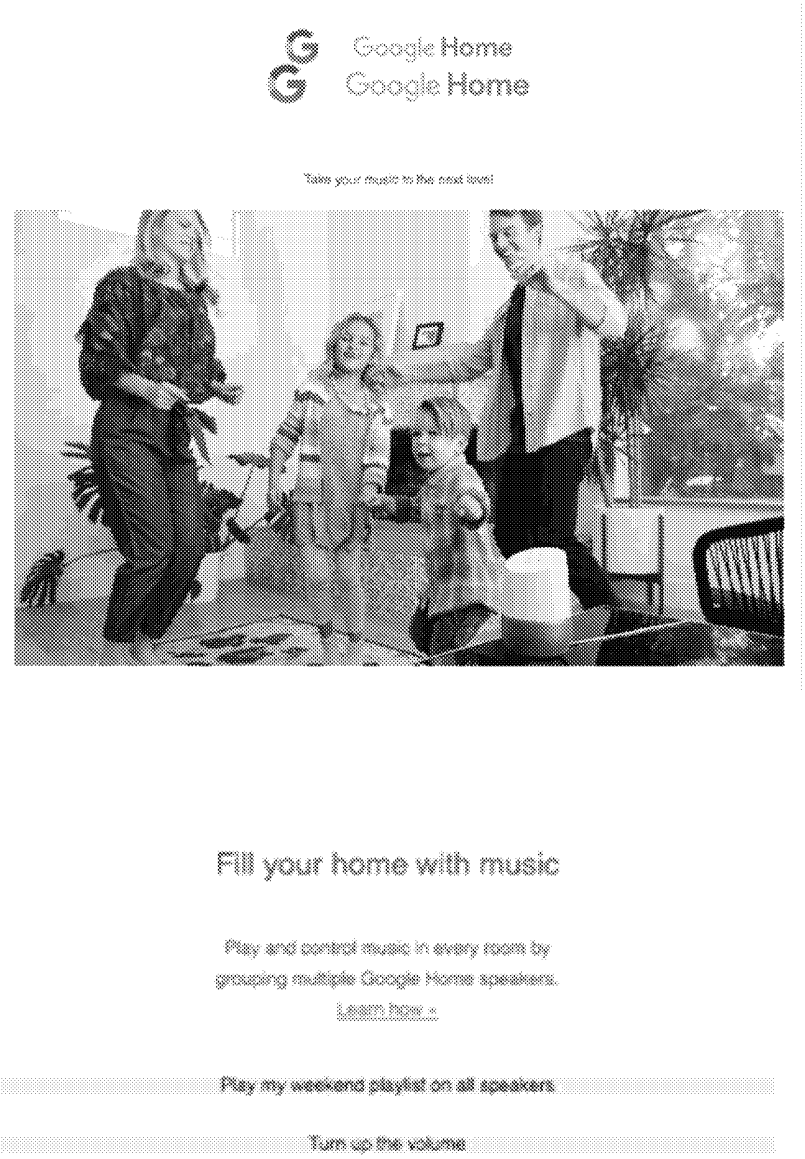
Google Press/Marketing



Source: Google Marketing Email, May 12, 2018

Google Press/Marketing

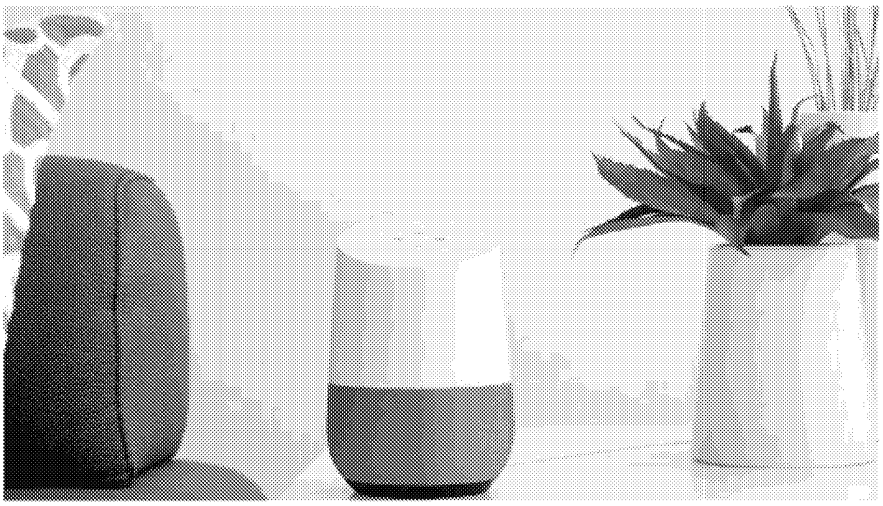
Google Home can now connect to any Bluetooth speaker

By Nick Pino March 28, 2018 Audio

Google Home's Bluetooth sharing feature casts shade on Sonos

If you've been eyeing a multi-room Sonos, you might want to hold off - Google Home has a new trick up its sleeve that can turn any old Bluetooth speaker into a connected part of a multi-room audio setup.

...



Once tethered to your Google Home, you'll be able to ask Google Assistant to play music on your other speakers either by itself or part of a larger group.

The trick here is that Google Home devices are just using Bluetooth to funnel music from its connected streaming services to the Bluetooth speaker. Which means your speaker needs to be on at all times to receive the music and it doesn't necessarily imbue the Bluetooth speaker with Google Assistant's intelligent voice recognition software, obviously. If you want to make a request to change the song, you'll have to be within shouting distance of the Home.

...

Despite a few quirks with the system, this is still a major upgrade for the Home, enabling you to form multi-room systems piece-by-piece with old Bluetooth speakers at a far cheaper price than a Sonos system.

Source: TechRadar.com, March 28, 2018

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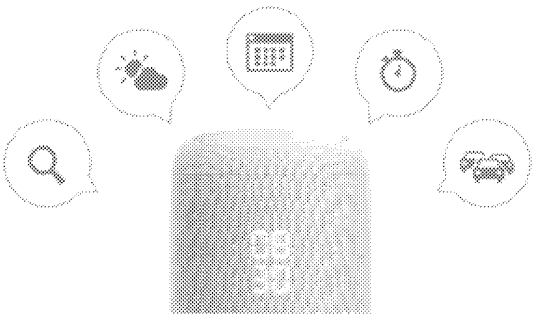
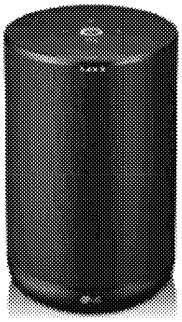
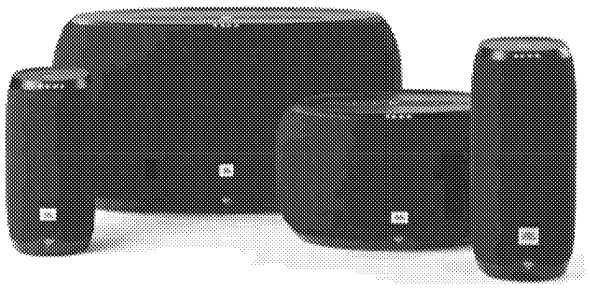
SONOS-ITC-00342408
SONOS-SVG2-00041850

Ecosystem Analysis

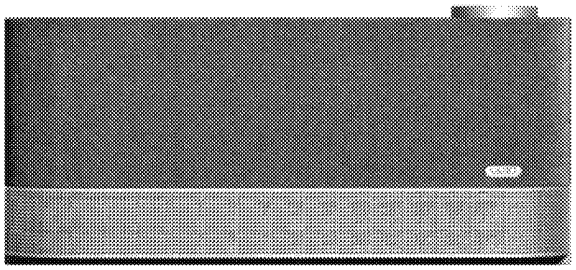
Chromecast Primary Devices: Products from Sony, LG, and JBL:

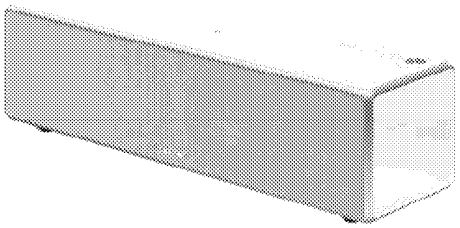






Chromecast Secondary Analysis: Products from Vizio and Sony:





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Chromecast Primary: JBL Link Callouts

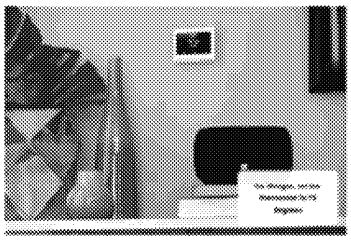
Google Feature	Non-Google Feature

LINK speakers deliver exceptional sound with the intelligence of Google Assistant.

Legendary sound, now smarter.

Take the party outside with LINK10 and LINK20.

Hands-free help from the Google Assistant



Control your smart home

Multi-room audio experience

Google Feature	Non-Google Feature
5/6 (83%)	1/6 (17%)

Chromecast Primary: JBL Link 10 Callouts

Google Feature	Non-Google Feature

Google Feature	Non-Google Feature
4/4 (100%)	0/4 (0%)

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Chromecast Primary: JBL Link 20 Callouts

Google Feature	Non-Google Feature

Google Feature	Non-Google Feature
4/4 (100%)	0/4 (0%)

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Chromecast Primary: JBL Link 300 Callouts

Google Feature	Non-Google Feature

Google Feature	Non-Google Feature
4/4 (100%)	0/4 (0%)

Chromecast Primary: JBL Link 500 Callouts

Google Feature	Non-Google Feature

Google Feature	Non-Google Feature
4/4 (100%)	0/4 (0%)

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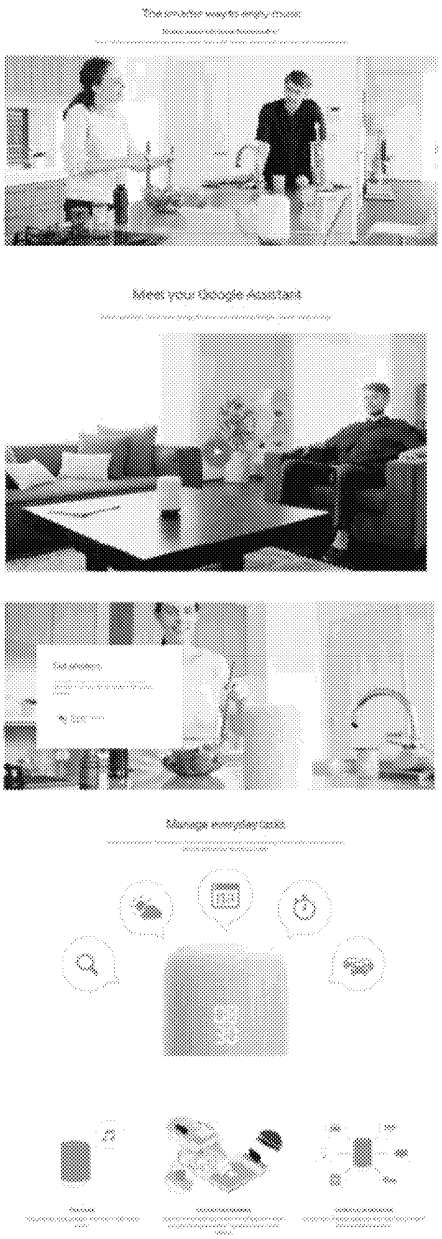
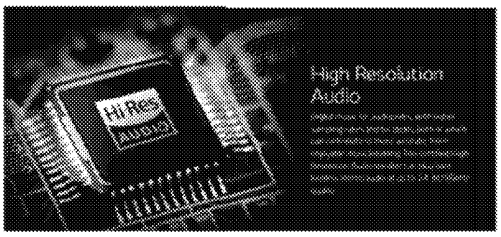
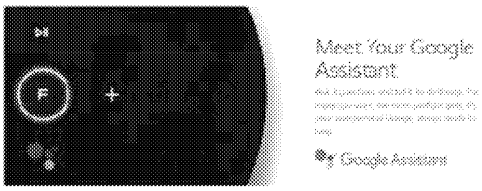
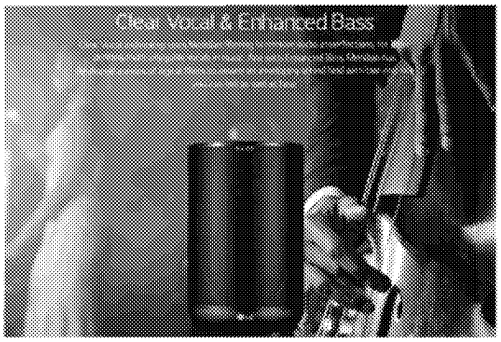
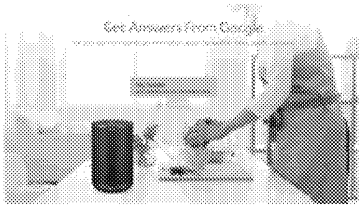
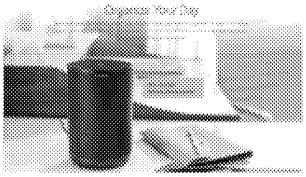
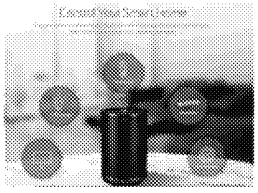
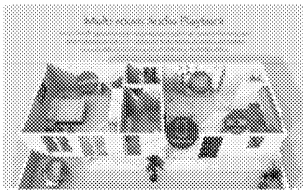
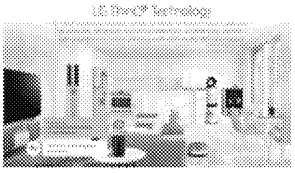
Chromecast Primary: Sony S50G Callouts

Google Feature	Non-Google Feature
	

Google Feature	Non-Google Feature
5% (4%)	4/6 (67%)

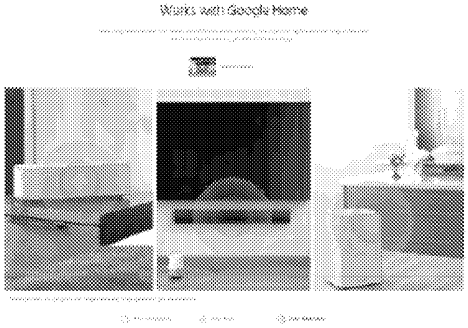
Chromecast Primary: LG WK7 Callouts

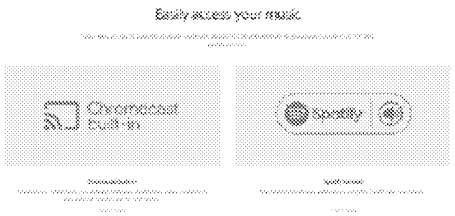
Google Feature	Non-Google Feature
	
	
	
	
	
	
	

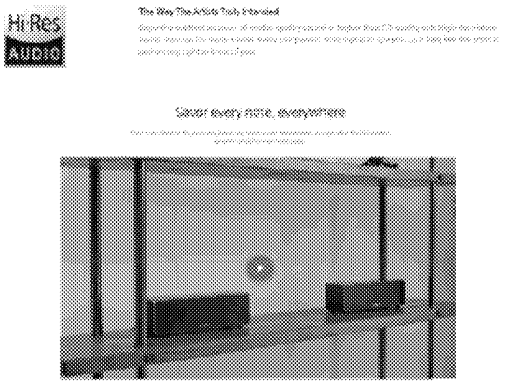
Google Feature	Non-Google Feature
2/9 (22%)	2/9 (22%)

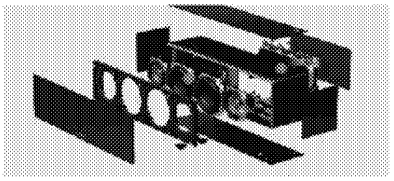
Chromecast Secondary: Sony SRS-ZR7 Callouts

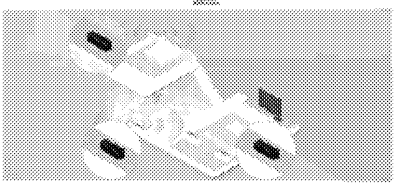
Google Feature	Non-Google Feature

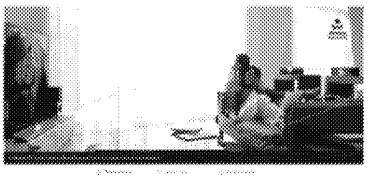


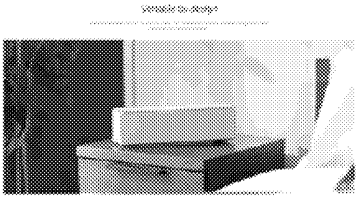












Google Feature	Non-Google Feature
3/10 (30%)	7/10 (70%)

Chromecast Secondary: Vizio Crave Callouts

Google Feature	Non-Google Feature

Crave Pro™ Wireless Speaker.

Profoundly Powerful.

Engineered For The Everyday.

Sensational Sound.

102.

Immersive Mode.

40.

Boosting Bass.

Balanced sound...

Multi-Room Pairing.

Turn Your Phone Into The Ultimate Remote.

Enhance Your Audio Experience.

Connect More with Chromecast.

Google Feature	Non-Google Feature
2/9 (22%)	7/9 (78%)